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**VRML INTERFACE SOFTWARE FOR IMAGE
AND DATA COMPILATION**

TECHNICAL FIELD

[0001] The present invention relates generally to database interfaces, and more particularly, to VRML interface software.

BACKGROUND ART

[0002] Widespread use of computers and other electronic devices has fueled the growth of printed circuit board (PCB) production. Like others who fabricate mass-produced items, PCB manufacturers continually seek to lower production costs while increasing the functionality, quality and reliability of their products.

[0003] Before a PCB design is manufactured, an assembler will often compose a complete layout drawing of the PCB that includes items such as electronic components or the location of traces on the board. Often a PCB assembler must gather this assembly information from many sources. For example, the board traces may be located on an image file residing in one database while the microchip package type images reside in a second database. In addition, the assembly information may be created using different software packages, such as Gerber or CAD. Thus, in order to create a layout drawing, the PCB assembler must first locate all of the image

files and then translate the image files from their software-specific platforms to a neutral file format. Not only is this translating step time consuming, but often the translations themselves are error-prone. The PCB assembler cannot rely on the accuracy of the data he receives once translated.

[0004] Because of the disadvantages of the prior art, it is apparent that a new method to compile information from image and data files created on differing software platforms is needed. This new method should adequately gather all of the information the PCB assembler requires to create a PCB layout drawing. The new method should also improve the accuracy of the data the assembler receives and should reduce the amount of time needed to gather the assembly data, thereby reducing overall manufacturing costs. The present invention is directed to meeting those ends.

SUMMARY OF THE INVENTION

[0005] One object of the invention is to utilize VRML interface software to compile images and data created on different software platforms into a platform-independent image. Another object of the invention is to provide an improved method to manufacture printed circuit boards (PCB). A third object of the invention is to reduce costs associated with manufacturing PCBs.

[0008] Additional advantages and features of the present invention will become apparent from the description that follows and may be realized by means of the instrumentalities and combinations particularly pointed out in the appended claims, taken in conjunction with the accompanying drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

[0009] In order that the invention may be well understood, there will now be described some embodiments thereof, given by way of example, reference being made to the accompanying drawing, in which:

[0010] FIGURE 1 illustrates the full architecture of a system incorporating a VRML interface software program in accordance with one embodiment of the present invention.

BEST MODE(S) FOR CARRYING OUT THE INVENTION

[0011] The present invention illustrates a VRML interface software program particularly suited for the printed circuit board (PCB) assembling environment. However, the present invention also applies to various other uses that may require a VRML interface software program.

[0012] Referring to FIGURE 1, an illustration of the full architecture 10 of a system incorporating a VRML interface software program in accordance with one embodiment of the present invention is shown. The figure shows three separate external databases to

which a printed circuit board (PCB) assembler connects to gather information regarding component placement on a PCB. One skilled in the art; however, would realize that this system is not limited to three external databases.

[0013] The first database 12 houses Gerber image files, which are drawings composed utilizing Gerber drafting software. Typically, these Gerber images contain information regarding PCB artwork, which consists of all traces and paths made on a PCB, the package dimensions of components, such as resistors, that will be placed on the PCB and can also contain mechanical drawings if the assembled PCB is mounted on a mechanical part. The Gerber files may also contain information about the circuit layout of pads, which illustrates the portions of the artwork that come into physical contact with the components. The circuit layout of pads provides the PCB assembler with a refined understanding of the connections that must be made during the assembly process.

[0014] The electronic assembly database 14 typically contains information saved in a neutral file format regarding the geometric physical locations of components, such as resistors or microchips, on the PCB. However, from this physical layout of the PCB alone, it is not possible to distinguish like components, such as a 100 Ω resistor from a 1K Ω resistor, because their physical geometry is the same but their values are not part of this file set in the database. This database 14 may also contain the PCB outline and a bill of materials.

[0015] Finally, the VRML library database 16 is partially comprised of package type images that are typically drawn using CAD-based software. Package type images visually describe specific component attributes. For example, a package type image for an HC1202 chip may show the physical arrangement of the chip's eight pins and briefly indicate the functions each specific pin provides, i.e. pin 5 is the logical AND output of input pin 1 and input pin 2. The VRML library database 16 may also contain fiducial information. The fiducial information is included in the database 16 to provide a PCB assembler with a common point to serve as a reference by which other components are assembled, much like the coordinate (0,0) typically serves as the origin for a grid and other points, such as (3,4), can be located once this origin is established. In addition, this database 16 can contain the coordinates of every component's location and rotation on the PCB.

[0016] A PCB assembler requires all of the information contained in the above three databases to assemble the PCB. One skilled in the art would realize that the PCB assembling information need not be stored in the particular database as described above; instead, the database structure can vary without departing from the invention. To access this PCB assembling information, the PCB assembler will log onto the World Wide Web (WWW) using a locally installed web browser 18, such as Netscape, where VRML interface software has been installed onto the browser 18. The PCB assembler the will use the VRML

interface software to make a request for a view of a specific PCB or a portion of a PCB. The VRML interface software will submit this request to the WWW server 20, which will, in turn, submits the request to a database interface 22, such as common gateway interface (CGI) or a Java Applets routine.

[0017] The database interface 22 retrieves the relevant information, regardless of what software platform was used to create the data, from the appropriate external databases 12, 14 and 16. Then the database interface 22 provides the VRML interface software with the raw data the PCB assembler requested and generates a new image. This new image combines all of the data from the varying databases 12, 14 and 16 into a neutral image file format, such as JPEG or GIF, that can be viewed on any computer independent from processor type.

[0018] From the foregoing, a new method to generate a VRML image based on software-specific images is brought to the art. The preferred embodiment's preceding description merely illustrates one of the many specific applications of the principles utilized in the present invention. Clearly, numerous and other arrangements can be evident to those skilled in the art without departing from the scope of the invention as defined by the following claims.